# FUSED CONCENTRIC TRIFOCAL CORNEAL CONTACT LENS

This application is a division of my prior filed application, Ser. No. 582,044, filed Sept. 26, 1966, which issued Oct. 14, 1969, as U.S. Pat. No. 3,472,581.

Prior art multifocal corneal contact lenses have employed materials of different refractive index fused together, however, these prior art lenses employ material of a low refractive index on the frontal portion of the lens and high refractive index material on the rearward portion of the lens, and consequently it is known that most prior art multifocal corneal contact lenses are quite thick and relatively undesirable because of such thickness.

Also prior art fused multifocal corneal contact lenses have used a radius of curvature at the interface curve between the materials of different refractive index steeper or of a shorter radius than the posterior base curve of the contact lens which rests in opposition to the eye, and consequently it is known that most prior art multifocals have extra thickness on the lens to compensate for the curvatures used.

Accordingly, it is an object of the present invention to provide a novel fused multifocal corneal contact lens which is quite thin, as compared to prior are fused multifocal corneal contact lenses.

Another object of the invention is to provide a multifocal corneal contact lens having an anterior portion of relatively high refractive index; a posterior portion of relatively lower refractive index; with the interface juncture curve or curves flatter than the posterior base curve of the lens; and the posterior base curve of the lens cut and polished to a depth or to a distance forwardly of the low-index material in the center of the lens over a desirable diameter, whereby the distance seeing portion of the lens will thus be located in the center of the lens in round form and consist of high index of refraction material only, and the near or intermediate seeing portion or portions of the lens will be immediately surrounding the distance seeing portion in annular form and consisting of a combination of high index of refraction material anterior to low index of refraction material.

Still another object of the invention is to provide a multifocal corneal contact lens having an anterior portion of relatively high refractive index; a posterior portion of relatively lower refractive index; with the interface juncture curve or curves flatter than the posterior base curve of the lens; and the posterior base curve of the lens cut and polished to a distance rearward of the interface curve; and the anterior curve of the lens cut and polished to a distance whereby it intersects the interface juncture curve at any desired diameter; whereby the near or intermediate seeing portions of the lens will be located in the center of the lens in round form and consist of high refractive index material anterior to low refractive index material, and the distance seeing portion of the lens will be immediately surrounding in annular form and consisting of low refractive index material.

Another object is to use a curve or curves at the interface juncture of the two media of different refractive index, which are flatter than the base curve on the posterior surface of the lens in order to minimize the thickness of the bifocal or trifocal (multifocal) segments.

Another object is to use a curve or curves at the interface juncture of the two media of different refractive index, which are flatter than the base curve on the posterior surface of the lens so that the resulting shape of the bifocal or trifocal will be annular form in order to provide near or intermediate vision above, as well as below the horizontal line of sight, when needed.

Another object of the invention is to provide a multifocal corneal contact lens in which the power of the peripheral portions of the lens are different by varying the curve or curves at the interface junction of two materials of different refractive index, thereby creating bifocals, trifocals, quadrifocals, or any variation of multifocals as may be desired.

Another object of the invention is to provide multifocal corneal contact lenses having an anterior portion of relatively high refractive index; a posterior portion of relative low refractive index; with the interface juncture having a curve or curves flatter than the posterior base curve of the lens; and the posterior base curve of the lens decentered and then cut and polished to a depth or position forwardly of the interface junction of the materials, so as to eliminate the low-index material at the top of the lens to any desired height, whereby the distance seeing portion of the lens will thus be located at the top of the lens and consist of a high index of refraction material, and the other seeing portion or portions of the lens will be at the bottom of the lens in crescent form consisting of a combination of high index of refraction material anterior to low index of refraction material, with the thickest portion of the lens being at the bottom automatically to control gravitation orientation of the lens.

Another object of the invention is to provide a multifocal corneal contact lens having various combinations of powers at various positions on the lens due to the provision of different spherical or toric powers on either the posterior or anterior surface of the lens in combination with the optical powers at the interface junction of the high and low index of refraction material of the lens.

Another object of the invention is to provide a multifocal corneal contact lens having a lenticular flange for the purpose of reducing center thickness on plus powered lenses or reducing edge thickness on minus powered lenses, or varying the weight distribution of any powered lens to aid in orientation.

Another object is to provide fused multifocal corneal contact lenses in other than round form on the periphery for purposes of orientation.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my fused multifocal corneal contact lenses, whereby the above-contemplated objects are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in detail on the accompanying drawings, wherein:

FIG. 1 is a vertical sectional view of a material of high refractive index;

FIG. 2 is a vertical sectional view of the material shown in FIG. 1, and having a spherical recess cut in one surface to form the curve of an interface junction;

FIG. 3 is a vertical sectional view of the high index of refraction of material, shown in FIG. 2, together with a lower refractive index material fused on the interface junction surface of the high refractive index material;

FIG. 4 is a vertical sectional view similar to that shown in FIG. 3, wherein a posterior base curved recess is formed in the material having a low refractive index, the base curve extending forwardly of the interface junction so as to eliminate the lower refractive index material form the center of the structure;

FIG. 5 is a vertical sectional view of the structure, shown in FIG. 4, and having an anterior generally spheroid surface formed of the higher refractive index material in order to provide for the necessary optical power for distance seeing at the center of a multifocal corneal contact lens, in accordance with the present invention;

FIG. 6 is an elevational view of the lens, shown in FIG. 5, and illustrating the annular appearance of the fused bifocal corneal contact lens of the invention;

FIG. 7 is a vertical sectional view similar to that shown in FIG. 2, but showing two spherical surfaces of different radii cut on the posterior surface of the high refractive index material ultimately to form a trifocal lens, the curves being such that each curve is flatter than the next most central curve, thereby indicating the possibilities of producing quadrifocals, quintifocals or any kind or number of multifocal lens;

FIG. 8 is an elevational view showing the concentric annular appearance of the various curves of the structure, shown in FIG. 7;

FIG. 9 is a vertical sectional view similar to that shown in FIG. 3, wherein the base curve or spherical recess of the lens is